

11 COLOR TESTS	Page 1 of 3
Division of Forensic Science  CONTROLLED SUBSTANCES TRAINING MANUAL	Amendment Designator: A
	Effective Date: 21-October-2005
<p style="text-align: center;"><b>11 COLOR TESTS</b></p> <p><b>11.1 Objectives</b></p> <p>11.1.1 To familiarize the trainee with the preparation, storage, and proper handling procedures of color test reagents</p> <p>11.1.2 To make the trainee proficient in the use of chemical color tests</p> <p>11.1.3 To make the trainee aware of the advantages, disadvantages, and limitations of color tests</p> <p>11.1.4 To make the trainee understand the theory of color tests</p> <p>11.1.5 To familiarize the trainee with field test kits and their applications</p> <p><b>11.2 Modes of Instruction</b></p> <p>11.2.1 Self-directed study through reading assignments and study questions</p> <p>11.2.2 Presentations and demonstrations</p> <p>11.2.3 Practical exercises</p> <p><b>11.3 Reference</b></p> <p>11.3.1 <i>Basic Training Program for Forensic Chemists</i>, U.S. Department of Justice, Drug Enforcement Administration, Office of Science and Technology, pp. 4-1 through 4-11</p> <p>11.3.2 Moffat, A. C., editor. <i>Clarke's Isolation and Identification of Drugs</i>. London: The Pharmaceutical Press, 1986, pp. 128-147.</p> <p>11.3.3 DFS Controlled Substances Procedures Manual, Color Tests Section.</p> <p>11.3.4 Johns, S. H., Wist, A. A., and Najam, A. R. "Spot Tests: A Color Chart Reference for Forensic Chemists", <i>Journal of Forensic Sciences</i>, July 1979, pp. 631-641.</p> <p>11.3.5 "Methods of Analysis for Alkaloids, Opiates, Marihuana, Barbiturates, and Miscellaneous Drugs." Internal Revenue Service, (Reprinted by the Bureau of Narcotics and Dangerous Drugs, U. S. Department of Justice), rev. 6-67.</p> <p>11.3.6 Feigl, Fritz. <i>Spot Tests in Organic Analysis</i>. Amsterdam: Elsevier Scientific, 1966.</p> <p>11.3.7 <i>U.S. Pharmacopeia National Formulary</i>, USP XX, 1980.</p> <p>11.3.8 Saferstein, Richard. <i>Forensic Science Handbook</i>. Prentice Hall Regents, Englewood Cliffs, NJ; 1982.</p> <p>11.3.9 Virginia Register, 6 VAC 20-220 and <i>Code of Virginia</i> § 9.1-102.</p> <p><b>11.4 Assignments</b></p> <p>11.4.1 Completion of required reading assignments (11.3.2, 11.3.3, and 11.3.4)</p> <p>11.4.2 Study questions</p> <p>11.4.3 Practical exercises</p>	

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<p><b>11.5 Study Questions</b></p> <p>11.5.1 Where can the recipes for each of the following color test reagents be found, list the types of compounds that react with each test, and state what reaction would be observed:</p> <ul style="list-style-type: none"> <li>• Marquis</li> <li>• Meckes</li> <li>• Froehdes</li> <li>• Cobalt thiocyanate</li> <li>• Ehrlich's</li> <li>• TBPEE</li> <li>• Dille – Koppanyi</li> <li>• Ferric Chloride</li> <li>• Tannic Acid</li> <li>• Stannous Chloride</li> <li>• Sodium Nitroprusside (Feigel's)</li> </ul> <p>11.5.2 For the following color test reagents, what would be an appropriate test compound for QA purposes? What would be the expected result?</p> <ul style="list-style-type: none"> <li>• Marquis</li> <li>• Meckes</li> <li>• Froehdes</li> <li>• Cobalt thiocyanate</li> <li>• Dille-Koppanyi</li> <li>• Van Urk's</li> </ul> <p>11.5.3 Describe as to a jury how a color test is performed, including the purpose and value of the test.</p> <p>11.5.4 An officer calls stating that the field test kit used on a submitted sample indicated the presence of heroin. Your analysis reveals no controlled substances. How might you explain this?</p> <p>11.5.5 Which field test kits are available for use in the Commonwealth of Virginia?</p> <p>11.5.6 Briefly describe the mechanisms of the following color test:</p> <p>11.5.6.1 Marquis</p> <p>11.5.6.2 Cobalt thiocyanate</p> <p>11.5.6.3 Van Urk's</p> <p>11.5.7 Describe the difference between the terms "sensitivity" and "selectivity" as they relate to color tests.</p> <p>11.5.8 Define "false positive". Give three examples of false positive color tests.</p> <p>11.5.9 Define "false negative". Give three examples of false negative color tests.</p> <p>11.5.10 What test can be used to detect Riboflavin? Thiamine? Niacin?</p> <p>11.5.11 Describe the Scott's test.</p> <p>11.5.12 Describe the use of blanks pertaining to spot tests.</p>	

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<p>11.5.13 What effect do mixtures have on spot test results?</p> <p>11.5.14 What is a flame test and what is the mechanism of their action?</p> <p>11.5.15 What effect does time have on color test reagents?</p> <p>11.5.16 Define the following terms:</p> <ul style="list-style-type: none"> <li>Precipitate</li> <li>Complex</li> <li>Ligand</li> <li>Coordination number</li> </ul> <p>11.5.17 What tests would you perform to determine the presence of the following ions:</p> <ul style="list-style-type: none"> <li><math>\text{HCO}_3^-</math></li> <li><math>\text{CO}_3^{2-}</math></li> <li><math>\text{SO}_4^{2-}</math></li> <li><math>\text{Cl}^-</math></li> <li><math>\text{NH}_4^+</math></li> <li><math>\text{K}^+</math></li> <li><math>\text{Na}^+</math></li> </ul> <p>11.5.18 Where can the QA procedures for color test reagents be found?</p> <p><b>11.6 Practical Exercise and Worksheets</b></p> <p>11.6.1 Prepare the following reagents and perform all necessary QA and documentation prior to use:</p> <ul style="list-style-type: none"> <li>Cobalt Thiocyanate with Stannous Chloride modification</li> <li>Marquis</li> <li>Meckes</li> <li>Froehdes</li> <li>Concentrated nitric acid</li> <li>Dille-Koppanyi</li> <li>TBPEE</li> <li>Tannic Acid</li> <li>Van Urk's and/or Ehrlich's</li> <li>Weber Test (for Hallucinogens only)</li> </ul> <p>11.6.2 Obtain standards (secondary, where possible) of the substances listed in Appendix B from the TC. Perform the color tests above for each substance and record in the Drug Known notebook. Some color tests may be eliminated for LSD, LAMPA, psilocin, psilocybin and bufotenine as per the TC. Save these standards for use in the Thin Layer Chromatography section.</p> <p>11.6.3 Obtain Lithium Carbonate from the TC and perform a flame test using the procedure listed in the USP.</p> <p><b>11.7 Modes of Evaluation</b></p> <p>11.7.1 Written examination</p> <p>11.7.2 Courtroom exercise (mini-mock trial)</p>	